

# NEW JAPANESE FUNGI

## NOTES AND TRANSLATIONS—VIII

TYÔZABURÔ TANAKA

PHYTOPHTHORA CARICA (Hara) Hori ex K. Sawada in Taiwan Hakubutsu Gakkwai Kwaihô (Journ. of Formosan Nat. Hist. Soc.) no. 26: 174-179. T. 5, xi, Nov. 1916. (Japanese.)

*Kawakamia Carica* Hara, Nôgyôkoku (Country of Agriculture) 9<sup>3</sup>: 24-27. Mar. 1915; in Nippon Engei Zasshi (Journ. Hort. Soc., Japan) 30<sup>4</sup>: 20-22. Apr. 1918.

*Phytophthora Fici* Hori, Byôchû-gai Zasshi (Journ. Plant Prot.) 2<sup>11</sup>: 930-932. Nov. 1915.

*Phytophthora Carica* (Hara) Hori in Byôchû-gai Zasshi (Journ. Plant Prot.) 2<sup>12</sup>: 1015-1017. Dec. 1915.

*Phytophthora Carica* Hara, K. Hara's Kwaju Byôgairon (A Discourse on Fruit Diseases) p. 431-436. Nov. 1916.

*Phytophthora* sp. Moeller in Bot. Mittheil. a. d. Tropen 9:3. 1901 (ex Sawada); Wilson in Mycologia 4<sup>2</sup>: 77. 1914. (ex Sawada).

Aërial hyphae branching, thin-walled, continuous or septate at maturity, hyaline, 3-10  $\mu$  across; conidiophores solitary or fasciculate, much resembling aërial hyphae, simple or branching directly below the conidium, or irregularly forked, continuous or rarely septate, 36-480  $\mu$  long, seldom attaining to 1,000  $\mu$ , 3.5-4.5  $\mu$  across; conidia pyriform, oblong, ellipsoid, ovoid, or fusoid, bearing a distinct papilla 4-8  $\mu$  long, thin-walled, finely granulate, hyaline, 26-112  $\times$  16-45  $\mu$ , wall contiguous to the end of conidiophores, often thickened, falling off at times with a part of conidiophore, germinating in water with germ tube or liberating zoöspores after 35 minutes; zoöspores several dozen from one conidia, ovoid or ellipsoid, ciliate at both ends, 12  $\times$  8  $\mu$ , later transforming themselves into transparent, spherical resting-spores of 9-12  $\mu$  in diam., which also soon germinate with germ tube 3-4  $\mu$  across; germ tubes of conidia protrude usually from apical

papilla but occasionally from other part much branched, 4-10  $\mu$  across, often terminated by acrogenous secondary spore of the shape of conidia, otherwise a globe, which germinates with germ tube or produces zoöspores on germination; chlamydospores formed in the host tissue at ends of endogenous hyphae, seldom formed on conidiophores, globose, ochraceous, 15-49  $\mu$ , commonly 40-45  $\mu$ , wall at first thin, later thickened to measure 2  $\mu$  across; oögonia and oöspore yet unknown.

On *Ficus Carica*, causing white-rot (*Shiro-kusare* in Japanese) of fruits.

Type localities: Komaba, Tôkyô, College of Agriculture grounds, on "White Genoa," Sept. 1909, S. Kawagoe & K. Hara (ex Hara); Gumma-ken Agricultural Experiment Station grounds, on "Black California," Sept. 1915 (ex Hori).

Distribution: Taiwan (Formosa), also occurring on "Black California" (ex Sawada).

Hara states (in Kwaju Byôgairon p. 432) the disease commences in August or September. The fruit becomes darker in color and water-logged in appearance and is followed by immediate liquefaction and decay. The affection is at first limited to a small sunken area, but soon spreads over the entire fruit, developing in a few days a thick cottony cover of mycelium on its surface. A disagreeable odor usually accompanies the decay. The surface of rotten fruits remaining on the twig is white and longitudinally wrinkled in the dried condition.

Illustrations: Hara's Kwaju Byôgairon (p. 433) gives 8 wood-cut figures illustrating the details of the fungus.

Notes: According to Hara's point of view, the genus *Kawakamia* ought to have its conidiophores unbranched or at least not branching immediately below the conidia (Hara '18 p. 22. See above). This distinction, however, is very uncertain and unreliable, as irregular branching of conidiophores is often observed in well established species of *Phytophthora*, e. g. *P. omnivora*. Sawada, dwelling upon *Kawakamia Cyperi* (Publication no. 102 of Agric. Exp. Stat., Taiwan, p. 10-18. June, 1916), rightly pointed out that the most important difference of *Kawakamia* from *Phytophthora* consists in having (1) well-developed haustoria and (2) its antheridia not tightly surrounding the oögonial

stalk, but simply attaching to the wall of oogonia at an arbitrary point, and (3) in its obligate parasitic nature. The conidium of *Kawakamia* is often reported to bear a collar cell at the basal end, but Sawada found this as a mere thickening of the wall, which is more prominent in *Kawakamia* than in *Phytophthora*.

CAPNODIUM TANAKAE Shirai and Hara sp. nov. in K. Hara's Kwaju Byôgairon (A discourse on fruit diseases) p. 239-242. T. 5, xi, Nov. 1916. (Japanese.)

Perithecia cylindric, simple or branched, with enlarged spherical apex containing asci, wall fungoid-parenchymatous in texture; asci clavate, tapering at both ends when fully matured, 6-8-spored,  $30-45 \times 10-12 \mu$ ; ascospores oblong or fusoid, not acutely pointed at both ends but rather blunt, 3-septate, fuscous,  $10-15 \times 4-5 \mu$ .

Saprophytic on fruits of *Citrus grandis* (pummelo), forming irregular patches of thin felt of dirty blackish color, which only reflect the light slightly. In culture, hyphae and a form of conidia developed, which are not sufficiently worked out to prove whether they belong to a generation of this species or something else. Hyphae thus formed are at first whitish, then turn to the characteristic sooty color, plentiful, branching, septate,  $3-5 \mu$  across; upright hyphae resume a rôle of conidiophores, producing catenulate conidia at the end; conidia ellipsoid or ovoid, both ends rounded, smooth, continuous,  $10-17 \times 5-7 \mu$ .

The crust is distinctly lighter in color than that of *Capnodium salicinum* and lacks the luster almost entirely. Microscopic characters are also distinct. No species resembling this has hitherto been described.

Illustrations: One woodcut and 1 black and white halftone figure showing the details of the fungus.

Note: The type material was collected by Tanaka at Kajiya, Yoshihama-mura, Kanagaa-ken, Nov. 7, 1909.

GLOEOSPORIUM FOLIICOLUM Nishida sp. nov. in T. Nishida's Shinpen Kankitsu no Byôgai to Yobôhō (A new discourse on citrus diseases and their protective measures) Tôkyô, p. 111-115. T. 3, xi, Nov. 1914. (Japanese.)

*Gloeosporium citricolum* Hori in Kwaju (Fruit Tree) no. 123: 21. June, 1913; in Engei no Tomo (Friend of Horticulture) 97: 627. Jul. 1913; in S. Hori's Shokubutsu Byôgai Kôwa (Lectures on plant diseases) 2: 113-114. Nov. 1916. *not* Massee.

Acervuli plentifully formed on upper surface of fallen leaves, also appearing in less amount on lower surface, scattered or more or less loosely gregarious, first subepidermal, later erumpent and raised, light reddish-brown, about  $120\mu$  in diam., also occurring on young twigs and on fruits; conidiophores densely fasciculate, cylindric, subacutely tapering toward the apex, 2-3-septate, branching, hyaline,  $36-48 \times 4-5\mu$ , terminated by conidia; conidia cylindric, not curved, rounded at the apex, bluntly pointed at the base, hyaline, sparingly nucleate,  $14-20 \times 4-6\mu$ , germinating from either end.

On *Citrus* spp. particularly on Navel orange, Satsuma (*Citrus nobilis* var. *Unshiu*), and Natsu-daidai (Japanese summer orange resembling grape-fruit).

Localities: Prefectures Wakayama, Hiroshima; Islands Kyû-shû, Taiwan.

Spots first appear on leaves in spring and summer as cloud-like irregular patches of somewhat dark color, which are indefinitely margined from the healthy part. Such leaves soon lose their vigor and defoliation immediately follows. Minute pinkish pustules then appear plentifully on the surface of fallen leaves. New shoots and fresh tips of the twig are also attacked, causing immediate change of color to yellowish-brown and finally to black, resulting in the entire death of that portion. On fruit, brownish spots are commonly met with, which soon develop pinkish pustules on the surface as in the case of the leaf.

Illustrations: 1 photograph (halftone) of badly damaged Satsuma plant at Wakayama prefecture (in 1911), and 1 woodcut showing a diseased leaf, conidiospores and conidia (both in Nishida l. c.).

Notes: In above cited literature Hori insists on the similarity of this fungus to *Gloeosporium citricolum* Massee, though it seems rather distinct in having branched conidiophores. Hemmi recently pointed out the parasitic nature of this fungus in Sapporo Nôrin Gakkwaihô (Journ. Soc. Agric. & Forestry, Sap-

poro) 10<sup>46</sup>: 239-282. Oct. 1918, while Sawada (in Taiwan Agr. Exp. Stat. Public. No. 100: 4. June 1916) and Hara (Discourse on fruit diseases p. 284. 1916) maintain their opinion that this is saprophytic. The disease is now widely spread all over Japan and Formosa causing annually somewhat notable damage to various kinds of Citrus, especially to Satsuma orange. Protective measures are also studied by local agricultural experiment stations, for instance Wakayama-ken prefectural station (*see* Progress Report for Fiscal Year Taishô 3, 1914, etc., etc.).

DACTYLARIA PANICI-PALUDOSI Sawada sp. nov. in Taiwan Haku-butso Gakkwai Kwaihô (Journ. of Formosan Nat. Hist. Soc.), no. 22: 78-80. T. 4, xii, Dec. 1915. (Japanese).

Follicolous; spots at first orbicular, later forming fusiform areas of  $5-23 \times 2-4$  mm., olivaceous-brown, then producing a gray or dark-colored, dusty substance which covers the lower surface, finally changing from the middle, into straw color; conidiophores fasciculate, simple or occasionally branched; curved near the apex, 1-3-septate, cinereous,  $80-160 \times 4-5 \mu$ , bearing a few conidia, not more than 10; conidia oblong-ovoid to obclavate, obtuse at the apex, rounded or rostrate at the base, 2-septate, slightly constricted, hyaline or cinereous,  $17-26 \times 8.5-12 \mu$ , average  $22 \times 10.2 \mu$ , germinating in water in two hours, germ tube long,  $2 \mu$  in diam., never producing chlamydospores.

On living leaves of *Panicum paludosum*.

Type localities: Chônaioshô, Taihoku-chô, Taiwan, Apr. 5 & Oct. 25, 1907, Suzuki; Aug. 13 & Nov. 16, 1908, Fujikuro; June 19, 1909, Sawada; Oct. 6, 1909, Fujikuro; May 16, 1910, Sawada; Sept. 23, 1910 & July 6, 1911, Fujikuro; Sept. 4, 1911, June 20, July 15, Aug. 7, 1914, & Nov. 21, 1915, Sawada: Kyûkô, Shin-chiku-chô, Oct. 10, 1915, Sawada: Taichû, Taichû-chô, Oct. 11, 1913, Fujikuro; June 1, 1907, Suzuki: Tôseikaku, Taihoku-chô, June 3, 1907, Suzuki: Rinkiho, Kagi-chô, May 27, 1907, Suzuki: Kôshiken, Tainan-chô, Nov. 8, 1909, Sawada: Bokusekikaku, Kwarenkô-chô, May 12, 1909, & May 30, 1911, Sawada.

Notes: Differs from rice blast fungus in its short and broad conidia which usually have marked elongation of rostra at the base, and also producing no chlamydospore on germination. This fungus is unable to infect the rice plant by inoculation, just as rice



blast fungus does no injury to *Panicum paludosum*. Similar relation was also found true in case of the Dactylaria of *Panicum sanguinale*.

In a later article (Nôji Shikenjô Tokubetsu Hôkoku—Special Bull., Agr. Exp. Stat.—Taiwan, no. 16: 65–66. June 1917). Sawada revised the diagnosis in following points:

Young round spots measure 2–3 mm. in diam.; conidiophores slightly swollen near the base, bearing 1–10 conidia on alternately inflected apices, brownish-gray, decreasing in intensity toward the apex; conidia pyriform or elongated-pyriform, with collar cell of  $1.7\text{--}2\ \mu$  diam.,  $17\text{--}28 \times 8.5\text{--}12\ \mu$  average  $22.5 \times 10.2\ \mu$ , terminal cell  $4\text{--}11\ \mu$  average  $7.4\ \mu$ , central cell  $5\text{--}8.5\ \mu$  average  $7\ \mu$ , basal cell  $6\text{--}10\ \mu$ , average  $8.1\ \mu$ ; diameter of germ tube  $3\text{--}3.5\ \mu$ .

Two additional plates (black and white lithograph) illustrate conidiophores, conidia and the germination of conidia, and one woodcut figure (on p. 20) gives general appearance of an affected leaf.

DACTYLARIA LEERSIAE Sawada sp. nov. in Taiwan Hakubutsu Gakkwai Kwaihô (Journ. of Formosan Nat. Hist. Soc.), no. 27/28: 252–253. T. 5, xii, Dec. 1916. (Japanese.)

Foliicolous; spots usually orbicular, 2–3 mm. in diam., or nearly fusiform,  $5 \times 2$  mm., straw-colored at center, brown on margin; conidiophores fasciculate or solitary, simple, 2–3-septate, a little swollen near the base, alternately inflected at the apex, brownish-gray at the lower part, gradually becoming lighter toward the apex,  $48\text{--}88 \times 4\text{--}5\ \mu$ ; conidia short-conic to elongate-conic, 2-septate, not constricted, rounded at the base which ends with a collar cell of  $1.2\text{--}1.8\ \mu$  in diam., hyaline,  $20\text{--}35 \times 7\text{--}10\ \mu$ , average  $27 \times 8.6\ \mu$ , apical cell  $6\text{--}13\ \mu$ , average  $8.7\ \mu$ , central cell  $7\text{--}12\ \mu$ , average  $8.2\ \mu$ , basal cell  $7\text{--}12\ \mu$ , average  $9\ \mu$ , basal cell not sinuate toward the papilla; germ tubes  $3\text{--}4\ \mu$  diam., septate, bearing acrogenous chlamydospores, chlamydospores cinereous,  $9.5\text{--}12 \times 9\text{--}10\ \mu$ .

On living leaves of *Leersia hexandra*.

Type localities: Chônaihoshô, Taihoku-chô, Taiwan, July 3, 1914, and Apr. 15, Dec. 4, 1915, and Aug. 18, 1916, Sawada; Shirin, Taihoku-chô, Sept. 23, 1916, Sawada.

Notes: Almost similar to rice blast fungus, only differing in (1) smaller collar cells which are attached to non-attenuated

base of conidia, (2) much larger chlamydospores, (3) less richly formed aërial hyphae in culture, and (4) when observed in culture distinctly more slender conidia with narrow basal cells. Hyphae of this species do not develop on bouillon-agar prepared with the extract of *Panicum paludosum*, while the rice blast fungus does very well on that medium. Inoculation failed on rice plant, just as the rice blast fungus has not been successfully transferred to *Leersia hexandra*.

Redescribing this species in Nôji Shikenjô Tokubetsu Hôkoku (Spec. Bull., Agr. Exp. Stat.), Taiwan, no. 16: 65 (June 1917), Sawada states that the spots are at first orbicular, 1–3 mm. in diam., then becoming angular, finally resuming fusiform shape. Illustration in black and white lithograph shows conidiophores, conidia, and germination of conidia in detail. Leaf spots are also shown in a text figure appearing on p. 21.

DACTYLARIA COSTI Sawada sp. nov. in Nôji Shikenjô Tokubetsu Hôkoku (Special Bull., Agr. Exp. Stat.), Taiwan, no. 16: 24–25, 66–67. T. 6, vi. June 1917. (Japanese.)

Spots usually occurring on leaves; small, orbicular, never becoming fusiform, 1–1.5 mm. in diam.; conidiophores fasciculate or solitary, simple, generally 2–3-septate, slightly swollen near the base, brownish-gray, becoming lighter toward the apex; conidia elongate-pyriform to clavate-fusoid, 2-septate, not constricted, both ends obtuse, often rounded at the base, with small collar cell of  $1.5\text{--}1.7\mu$  in diam., hyaline,  $20\text{--}30 \times 7.5\text{--}10\mu$  average  $24 \times 8.6\mu$ , apical cell  $8.5\text{--}12\mu$ , average  $10.6\mu$ , other cells practically in equal length, basal cell not attenuated toward the papilla.

On living leaves of *Costus speciosus*.

Type locality: Chûho, Kagi-chô, Taiwan, Oct. 15, 1913, T. Kawakami.

Illustrations: One text figure (on p. 24) showing leaf spots, and one black and white lithographic plate giving detailed figures of conidia.

Note: In an elaborate article of Y. Nishikado in Ohara Nôgyô Kenkyûsho Hôkoku (Report of the Ohara Agricultural Institute) 12: 171–218, Dec. 1917, two more species of blast fungi found on *Setaria* spp. and on *Zingiber* spp. are described which are determined as spp. nov., *Piricularia Setariae* and *P. Zingib-*

*beri* respectively. It seems more likely that all these blast fungi belong to *Piricularia* rather than *Dactylaria*, as they are provided with solitary conidia which are produced at the end of more or less elongate, spike-like conidiophores, which can never be termed capitate, as was pointed out by Nishikado (l. c., p. 210). S. Ito, therefore, suggested the new combination of Sawada's three new species as *Piricularia Panicipaludosi*, *Piricularia Leersiae*, and *Piricularia Costi* (Bot. Mag., Tôkyô 32<sup>882</sup>: 307-308. Japanese. Oct. 1918).

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